

**Simulation of Synoptic and Sub-synoptic Scale Phenomena
Associated with the East Asian Summer Monsoon
Using a High-Resolution GCM**

NGAR-CHEUNG LAU AND JEFFREY J. PLOSHAY

*Geophysical Fluid Dynamics Laboratory/NOAA
Princeton University
Princeton, New Jersey*

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ABSTRACT

A 20-year simulation using a global atmospheric general circulation model with a resolution of 0.5° latitude by 0.625° longitude is compared with observational findings, and against simulations based on other model versions with different resolutions. The primary goal of this survey is to assess model performance in reproducing various summertime phenomena related to the continental-scale Asian monsoon in general, and the regional-scale East Asian monsoon in particular.

In both model and observed atmospheres, the seasonal march of the precipitation centers associated with the Asian summer monsoon is characterized by onsets occurring earliest over Indochina, and subsequently over Bay of Bengal, South China Sea, western India/Arabian Sea, and western Pacific. This evolution is accompanied by southwesterly low-level flows over the rainy regions, as well as northwestward migration of the 200 mb Tibetan Anticyclone. Analysis of the heat sources and sinks in various regions illustrate the prominent role of condensational heating in the local energy budget during the mature phases of monsoon development.

In accord with observations, the simulated monsoon rains in the East Asian sector are organized about zonally elongated ‘Meiyu-Baiu’ (Plum Rain) systems. These precipitation features typically advance to higher latitudes through several discrete poleward jumps during the June-July period, in conjunction with northward movement of the axis of the low-level anticyclone over the subtropical western Pacific. A detailed case study is performed on a prominent rainy episode in the simulation. The model is capable of reproducing the observed intense gradients in temperature, humidity and moist static stability in the vicinity of the Meiyu-Baiu front, as well as the spatial relationships between the rainband and the three-dimensional flow field. The axis of the Meiyu-Baiu rainband in this event is aligned with the trajectory of a succession of mesoscale cyclonic vortices, which originate from southwestern China and travel northeastward over the Yangtze River Basin.